



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:  
Paul Shirley, et al.

Serial No.: 10/765,481

Filed: January 27, 2004

For: Method and Apparatus for a Two-  
Step Resist Soft Bake to Prevent  
ILD Outgassing During  
Semiconductor Processor

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December 31, 2007  
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**REPLY BRIEF PURSUANT TO 37 C.F.R. § 41.41 AND IN RESPONSE  
TO THE EXAMINER'S ANSWER MAILED OCTOBER 31, 2007**

This Reply Brief is being filed pursuant to 37 C.F.R. § 41.41 and in response to the Examiner's Answer mailed on October 31, 2007. Specifically, this Reply Brief addresses the Examiner's continuing pattern of misinterpretation of Wolf and Tauber, Silicon Processing for the VLSI Era Volume 1: Process Technology (hereinafter "the Wolf reference") and the pending claims. However, in the interest of brevity, Appellants address below only those issues or arguments raised the Examiner's Answer that are particularly noteworthy. In view of Appellants' attempt to avoid repetition in this Reply,

Appellants respectfully request that the Board consider Appellants' complete arguments set forth in the previously filed Appeal Brief.

**First Ground of Rejection**

Claims 1-8, 11, and 12 were rejected under 35 U.S.C. 102(b) as being anticipated by Wolf. Independent claims 1 and 12 recite a *two-step* soft-bake. For example, claim 1 recites:

A method of soft-baking a semiconductor wafer substrate,  
comprising the acts of:

- (a) soft-baking a substrate coated with a resist at a first temperature for a first predetermined period of time;  
and
- (b) after act (a), soft-baking the substrate coated with the resist at a second higher temperature for a second predetermined period of time.

(Emphasis added).

In contrast, the Wolf reference is absolutely devoid of a *two-step* soft-bake. Instead, Wolf teaches the typical *single-step* soft-bake. See Wolf, pages 434-436; Fig. 14. The Examiner focused on the infrared single-step soft-bake of Wolf. See Final Office Action, page 6 (citing Wolf, page 437 and Figure 12 (c)); Examiner's Answer, pages 3, 4, and 7. The Examiner contended incorrectly that the infinite number of instantaneous temperatures experienced by the Wolf wafer (during the temperature ramp of the Wolf wafer) can be a selected bake temperature for a period of time. To the

contrary, the Wolf temperatures during the ramp are instantaneous, and the wafer is *not* baked at a temperature for a period of time (as claimed) during the ramp. The Examiner misinterprets the claim in contending that “Appellant is silent as to weather [sic] the first temperature is constant for a period of time.” *See* Examiner’s Answer, page 7. To the contrary, claim 1 recites that the first temperature is a temperature for a period of time. Thus, necessarily, based on the plain language of the claim (and in view of the present disclosure), the wafer is subjected to a given temperature for a period of time, and thus substantially a constant temperature for a period of time during the first step.

Indeed, the claims recite a two-step soft bake with two selected temperatures for two respective periods of time. In contrast, there is only a single predetermined period of time (3-4 minutes) in the Wolf IR single-step soft bake. *See* Wolf, page 436; *see also* page 435 (seeking to provide a uniform temperature during the soft bake). Further, the selected temperature in the Wolf IR bake is a single temperature (at apparently about 105 °C). *See* Fig. 20 (c).

In contrast to the Examiner’s citing of case law (in which Appellants believe the Examiner has stretched the cited opinions well beyond their holdings in application to the present claims), Appellants believe that the Examiner has improperly ignored the present specification in interpreting the claims. *See* Examiner’s Answer, pages 7 and 8. Indeed, the Examiner ignores the recent case law of the Federal Circuit in ignoring the present specification. *See, e.g., Phillips v. AWH Corp.*, 75 U.S.P.Q.2d 1321, 1326 (Fed. Cir.

2005). The Examiner did not recognize (or give any weight) to the two-step soft-bake processes described in the specification which support and provide context/interpretation of the present claims. To be sure, the specification clearly explains that a two-step soft bake is employed in lieu of the traditional single-step soft bake, and which appropriately explains the subject matter of the present claims. *See, e.g.*, Application, page 9, line 12 - page 10, line 13; *Phillips v. AWH Corp.*, 75 U.S.P.Q.2d 1321, 1326 (Fed. Cir. 2005) (citations omitted) (explaining that the specification is “the primary basis for construing the claims” and that usually it is “dispositive”). One should rely heavily on the written description for guidance as to the meaning of the claims. *See id.*

As disclosed in the present specification, the initial first-step bake of the claimed soft-bake is performed by setting the temperature of a thermal unit (e.g., temperature chamber, oven, hot plate) at a temperature lower than traditional soft-bake temperatures. *See, e.g.*, Application, page 10, line 15 – page 13, line 16. In the subsequent second bake, the wafer is then subjected to a higher and more traditional soft-bake temperature with the same thermal unit (via cycling the thermal unit to a higher temperature) or with a second thermal unit already set at the higher temperature. *Id.* The two-step soft-bake is employed to inhibit the formation of resist craters. *Id.*

For each of the reasons set forth above, Appellants respectfully request that the Board overturn the Examiner’s rejection of independent claims 1 and 12, as well as the claims that depend therefrom.

**Second Ground of Rejection**

Dependent claims 9 and 10 were rejected under 35 U.S.C. 103(a) as being unpatentable over Wolf as applied to claims 1-7 above. Appellants respectfully traverse this rejection. As acknowledged by the Examiner, Wolf fails to disclose the specific temperature range and time period recited in claims 9 and 10, respectively. *See* Office Action, pages 4-5; Examiner's answer, pages 5 and 6; Wolf, pages 429-437 and 452-453.

Further, contrary to the Examiner's assertions, Appellants emphasize that the specific process conditions (i.e., temperature and time) associated with the second soft-bake step, as recited in dependent claims 9 and 10, are *not* obvious. *See* Office Action, pages 4-6. Indeed, without the benefit of the present application, one of ordinary skill in the art would not know to employ a two-step soft-bake, in general, much less a two-step soft-bake that utilizes the process conditions recited in claims 9 and 10. To be sure, Wolf teaches a much different bake timing. Again, the Wolf reference teaches the typical *single-step* soft-bake and is oblivious to the concept of a *two-step* soft-bake.

Also, contrary to the Examiner's assertions on pages 5 and 6 of the Examiner's Answer, the unique results (e.g., no resist craters) associated with the new soft-bake (having a second baking step) with the claimed process conditions are discussed in the present specification. *See, e.g.*, Application, page 9, lines 12-21. Without a doubt, the claimed first-step at a lower temperature combined with the claimed second-step at a higher temperature are discussed in the specification as being important to the invention,

i.e., in the reason for and result of inhibiting the formation of resist craters . *See, e.g.*, page 9, line 12 – page 10, line 13. It is surprising that the Examiner would label such important aspects of the present techniques as result effective variables, especially considering the apparent absence in the prior art of a two-step soft bake and it s conditions (and the beneficial results). *See, e.g.*, Examiner's Answer, page 5.

In view of these reasons, Appellants respectfully request that the Board direct the Examiner to withdraw the foregoing rejection of claims 9 and 10 under 35 U.S.C. § 103(a), and to allow the claims.

**Conclusion**

The foregoing are only reiterative points regarding the reasons why the pending claims are allowable. Appellants rely upon all of the reasons advanced in the Appeal Brief, and respectfully request that the Board carefully review the claims in view of these arguments and indicate the allowability of the claimed subject matter.

Respectfully submitted,



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